POWERED ROPE ASCENDER AND PORTABLE ROPE PULLING DEVICE

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 60/673,212, filed Apr. 20, 2005, entitled "Powered Rope Ascender and Portable Rope Pulling Device," and U.S. Provisional Application No. 60/717,343, filed Sep. 15, 2005, entitled "Powered Rope Ascender and Portable Rope Pulling Device," both of which are incorporated by reference herein.

FIELD OF INVENTION

[0002] This invention relates to devices for moving an object by pulling on an elongate element to which the object is attached. More particularly, the invention relates to a device that can lift or pull heavy objects by pulling on a rope or cable.

BACKGROUND OF THE INVENTION

[0003] Winches are typically used to lift heavy loads or pull loads across horizontal obstacles. Winches are either motor-driven or hand powered and utilize a drum around which a wire rope (i.e. metal cable) or chain is wound. Manually lifting or pulling heavy objects is not a viable option due to the strength required to lift or pull such objects. Often, fatigue and injury result from manually lifting or pulling such objects. This is why winches are used; they possess massive pulling and towing capabilities, and can serve well for handling heavy objects.

[0004] However, winches are limited in their usefulness for several reasons. First, the cable or rope is fixed permanently to the drum, which limits the maximum pull distance and restricts the towing medium to only that rope or cable. Second, the winch must be fixed to a solid structure to be used, limiting its placement and usability. Third, controlled release of tension is not a capability of many winches, further limiting usability.

[0005] Current technology in rope ascenders used by people for vertical climbing consists of passive rope ascenders which must be used in pairs. These rope ascenders function as a one-way rope clamp, to be used in pairs. By alternating which ascender bears the load and which ascender advances, upward motion along a rope can be created.

[0006] Passive ascenders such as these are severely limited in their usefulness for several reasons. First, they rely on the strength of the user for upward mobility. Thus, passive ascenders are not useful in rescue situations where an injured person needs to move up a rope. Second, the need to grip one ascender with each hand limits multi-tasking during an ascent because both hands are in use. Third, the rate and extent of an ascent are limited to the capabilities of the user. Fourth, the diamond grit used to grip the rope is often too abrasive, destroying climbing ropes for future use. Fifth, the type of rope to be used is limited by what the ascenders' one-way locks can interact properly with.

[0007] Raising heavy loads upward via cable is accomplished by winches pulling from above the load, or by a device such as a hydraulic lift that pushes from below. Passive rope ascenders are useless for moving a dead weight load upward along a rope. U.S. Pat. No. 6,488,267 to Goldberg et al., entitled "Apparatus for Lifting or Pulling a Load" is an apparatus which uses two passive ascenders along a rope with a pneumatic piston replacing the power a human would normally provide. Thus, this powered device is limited in its usefulness by the same factors mentioned above. In addition, the lifting capacity and rate of ascent are is limited by the power source that fuels the pneumatic piston.

[0008] A further drawback of this design is that at any reasonable rate the load will experience a significant jerking motion in the upward direction during an ascent. Therefore, fragile loads will be at risk if this device is used.

[0009] It is therefore an object of the present invention to provide an apparatus for lifting or pulling heavy loads which solves one or more of the problems associated with the conventional methods and techniques described above.

[0010] It is another object of the present invention to provide an apparatus for lifting or pulling heavy loads which can be manufactured at reasonable costs.

[0011] It would also be desirable as well to be able to attach any such rope pulling device to a rope at any point along that rope without having to thread an end of the rope or cable through the device. This would increase the usability of such a device considerably over other rope pulling and climbing devices, allowing for instance a user to attach himself for ascent at a second story window past which a rope hangs.

[0012] Other objects and advantages of the present invention will be apparent to one of ordinary skill in the art in light of the ensuing description of the present invention. One or more of these objectives may include:

[0013] (a) to provide a line pulling device that can handle a range of rope types, cables, and diameters;

[0014] (b) to provide a device which does not require an end of the rope or cable to be fixed to the device;

[0015] (c) to provide a device which provides a smooth, controlled, continuous pull;

[0016] (d) to provide a device which itself is capable of traveling upward along a rope or cable smoothly and continuously to raise a load or a person;

[0017] (e) to provide a device which is easy and intuitive to use by minimally trained or untrained personnel;

[0018] (f) to provide a device which can let out or descend a taut rope or cable at a controlled rate with a range of loads;

[0019] (g) to provide a device which can apply its pulling force both at high force levels, for portable winching applications, and at fast rates, for rapid vertical ascents;

[0020] (h) to provide a device with a safety lock mechanism that prevents unwanted reverse motion of the rope or cable;

[0021] (i) to provide a device that can attach to a rope or cable at any point without having to thread an end of the rope or cable through the device;

[0022] (j) to provide a device that is not limited in its source of power to any particular type of rotational motor; and